

Accelerating 300mm Conversion using Industry Standards

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Agenda

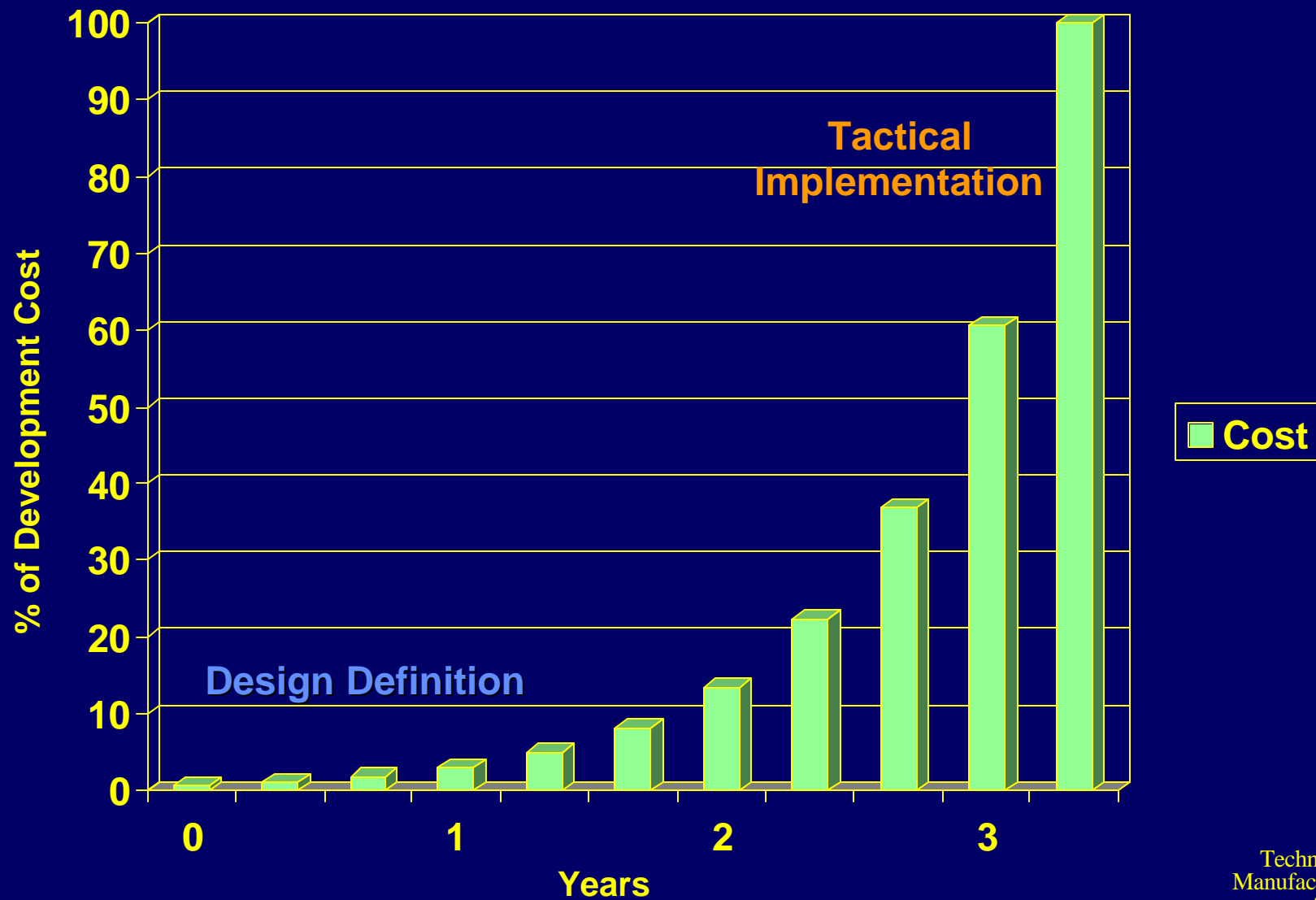
- ◆ Intercepting Process Tool Development Cycle
- ◆ Linking to Standards Development Cycle
- ◆ Areas for Standards Improvement
- ◆ Intel 300mm Program Status
- ◆ Intel Standards Assessment

Process Tool Development

- ◆ Process equipment development cycle from initiation to production maturity is multi-year.
 - 3~5 years not uncommon for new technologies
 - > 1 year required even for mature technologies/platforms
- ◆ Development cycle comprises 2 main phases:
 - Design Definition
 - Identifying customer/technical requirements
 - Strategic planning for implementation directions
 - Tactical Implementation
 - Building prototype
 - Iterating designs to final configuration
- ◆ Development costs escalate rapidly once Tactical Implementation is underway.

Predicted Development Costs

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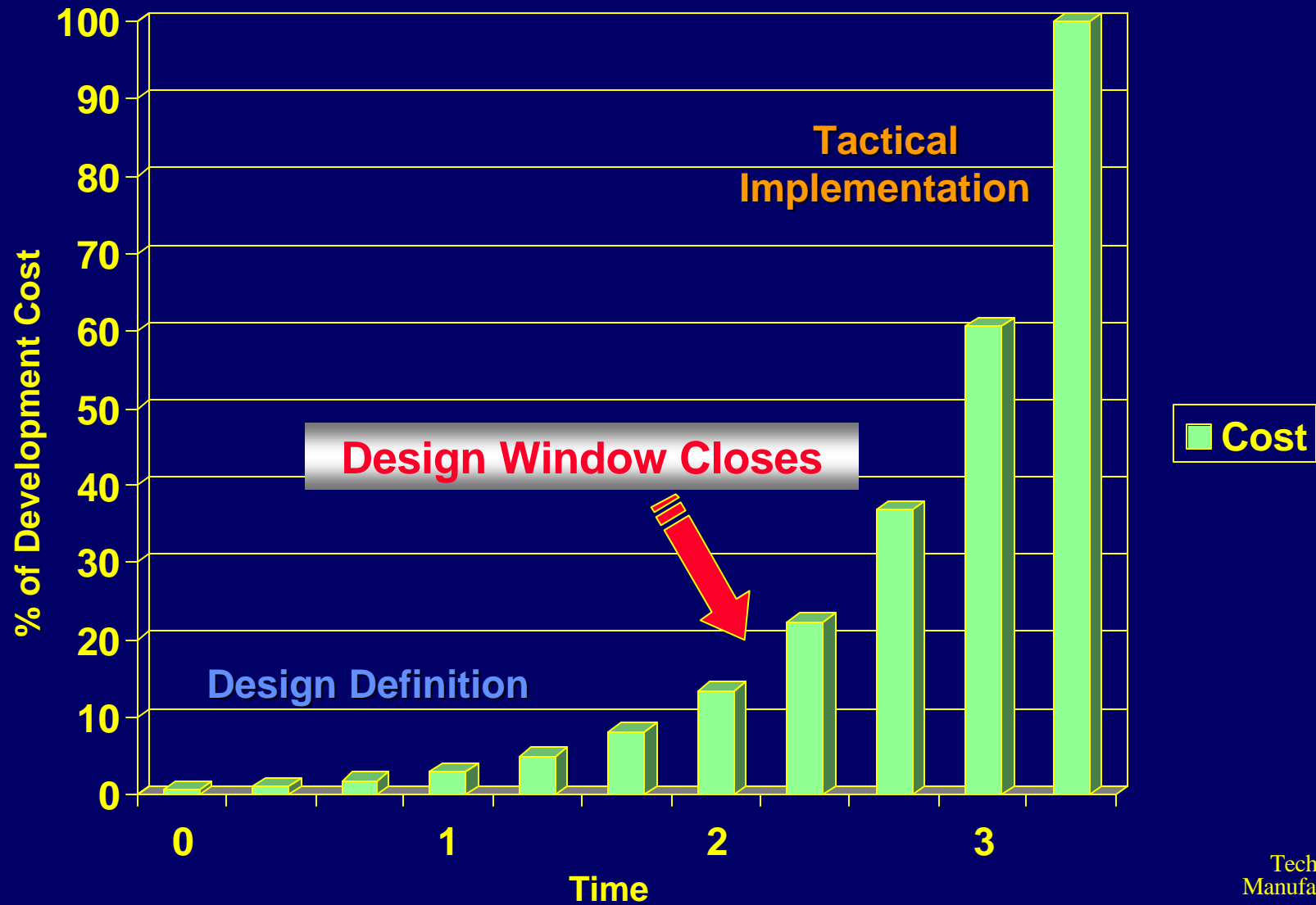


Design Definition

- ◆ Market research determines required attributes.
 - Focus on identifying commonality from majority of customers.
- ◆ Common attributes define the strategic direction.
 - Tactical implementation plan is based on direction.
- ◆ Standards process can significantly reduce the market research phase by direct communication.
 - Must be available during Design Definition window.
 - Must be consistent with vision of implementation.
 - Must represent agreement between majority of potential customers.
- ◆ Failure to meet Design Definition window results in rapidly increasing costs to implement.

Design/Implementation Transition

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Standards Development Cycle

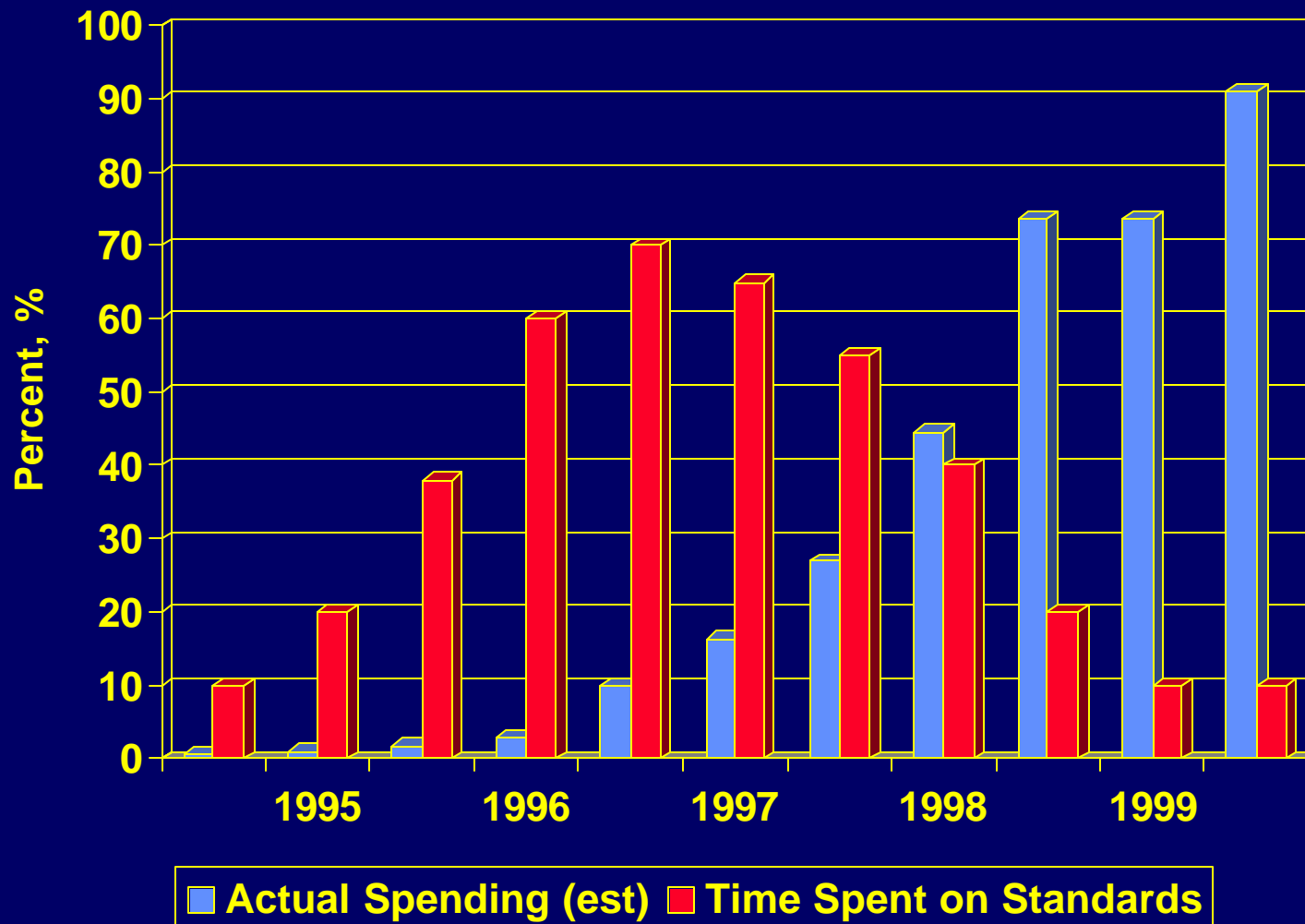
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- ◆ Early formation of a standard resides in individual customers development of implementation visions.
- ◆ Aspects of these visions can mature into standards if they possess common elements.
 - This requires sharing of visions between potential competitors
 - Consortia and/or strategic alliances provide an arena.
 - Sematech, I300I, SELETE and J300 are examples
- ◆ Common elements must be transformed into detailed specifications through negotiation.
 - This negotiation is critical to developing a coherent set of requirements that are universally recognized.
 - SEMI provides the mechanism for this transformation.
 - Defacto standards can disrupt or accelerate this process.

Critical Links for Standards

- ◆ Optimal use of available resources to deliver the required product is the main objective.
 - Reduces time to market and reduces cost
- ◆ Failure to engage and educate suppliers early results in lost time and lost opportunities.
 - Suppliers may be forced to commit to non-compliant designs in order to meet schedule.
 - Non-optimal use of resources results from correcting designs.
- ◆ Standards must be accessible to suppliers as early as possible in the Tool Development Cycle.
 - Suppliers should be engaged during the vision stage for feedback.
 - Suppliers should be engaged during the negotiation stage.
 - Final specifications should be immediately available to suppliers.
- ◆ Supplier education is critical aspect of standards.

Actual Spending and Standards Activity Levels



Areas for SEMI Standards Improvement

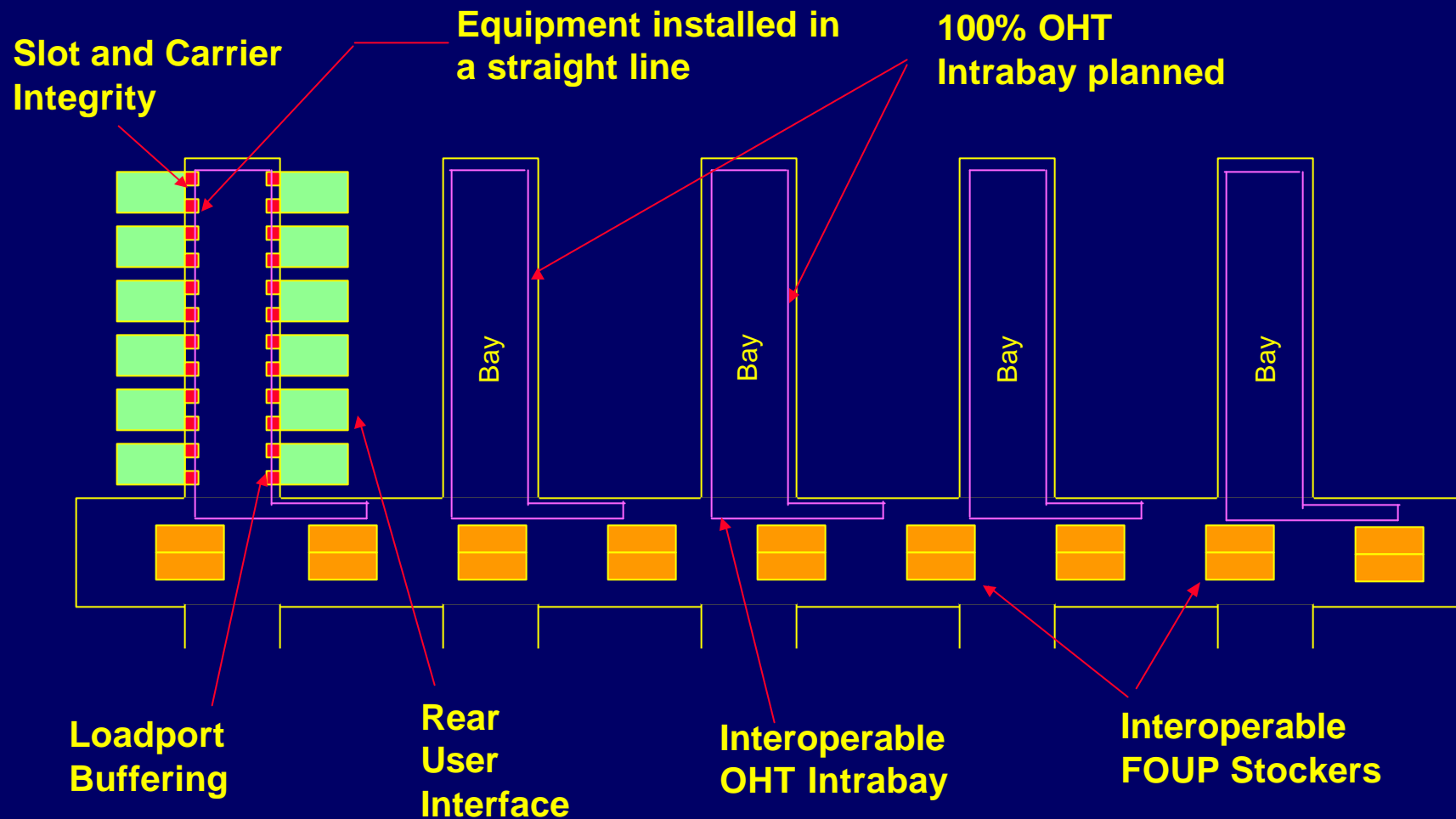
- ◆ SEMI Standards publication speed needs big improvement.
 - SEMI must work to meet the 45/75 days publication commitment.
 - Intel not satisfied with publication progress.
 - Equipment suppliers need access to Standards work in progress.
- ◆ To be successful, SEMI must reduce this cycle time.

Intel 300mm Program Status

- ◆ Actively pursued development of a 300mm Factory Vision in 1994.
- ◆ Shared this vision with Supplier, other IC makers and I300I beginning in 1995.
- ◆ Worked proactively with J300 on Factory Guidelines.
 - Defines how factories will be configured and laid out.
- ◆ Activated 300mm program in June 1999 based on assessments of tool readiness and Standards compliance.
 - Interbay AMHS being installed at D1C fab in Hillsboro, OR .
 - Process Equipment and Intrabay deliveries to D1C fab expected to commence January 2000.
 - Characterization/process development in 2000-'01.
 - Production ramp expected in 2002 on 0.13um process.

Standards at work in D1C

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Intel Standards Assessment

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- ◆ Key Learnings from evaluated and installed equipment:
 - Compliance to Automation standards is good.
 - However, field adjustment is needed to make many elements work.
 - E84 (OHT-Equipment handshake) compliance is not good.
 - Example of standard completed too late in development cycle.
 - FOUP/Loadport interoperability is still a concern.
 - Best Practice Document/Fixtures can resolve key issues.

Summary and Conclusion

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- ◆ Standards must be available early in Process Equipment Development Cycle to reduce cost.
- ◆ The window of opportunity for 300mm Standards cost savings has closed.
 - High cost and timing impacts likely. Savings would be lost.
- ◆ Changes to 300mm Standards will come at a significant cost.
 - Containment of Standards changes should be pursued.
 - Only changes to fix critical issues should be considered.
- ◆ Initial assessment of 300mm equipment indicates good compliance to required Standards.
 - Recent standards that missed window are problems.
 - Additional clarifications/methods can be used to correct minor issues without causing disruptions.
- ◆ SEMI must demonstrate cycle time improvement to publish Standards.